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LEAD TECHNICAL ABSTRACTS

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July, 1961

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LEAD TECHNICAL ABSTRACTS 12

A selection of Abstracts of Literature and Patents
on the Utilisation of Lead and its Alloys

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Issued by
LEAD DEVELOPMENT ASSOCIATION
34 Berkeley Square, London, W.1 · Grosvenor 8422

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In the event of books, documents, articles and patents, quoted in Lead Technical Abstracts, being unobtainable from or through local libraries, technical booksellers (many of whom provide an international service) or appropriate government departments, applicants should notify their difficulties to the Association, which will do its best to assist.

ANALYSIS

653 **Rapid Estimation of Copper in Type Metals and Lead-Base Babbitts** — **J. Brinn**

Metallurgia, Jan., 1961, 63, 52.

In view of the undesirability of copper in type metal a rapid method has been devised, based on colorimetry employing rubeanic acid giving reasonable accuracy and taking not more than 15 minutes to complete.

BATTERIES

654 **Plante Centennial Commemorative Issue and Extended Abstracts of Papers presented at the Sessions of the Battery Division of the Electrochemical Society, October, 1960** — **Electrochemical Society**

Brochure, 100 pp.

Extended abstracts of 27 papers, 11 of which deal with lead-acid storage batteries. Also various historical material covering invention of storage battery by Planté.

BEARINGS

655 **Low Friction Coating Works Best at 600–1200°F (316–649°C): Lead Monoxide Provides High Temperature Bearing Surface** — **NASA Lewis Research Center**

Materials in Design Engineering, Sept., 1960, 52(3), 9.

Low friction coatings of lead oxide are applied to stainless steel or Inconel. The coating is sprayed as a water slurry or may be applied as a dry powder and is then fired at 1650–1800°F. At high temperatures friction coefficients are less than those for MoS_2; endurance is better except at room temperature.

CABLES

656 **Development of a Continuous Extrusion Machine for Sheathing Cable with Lead Alloys** — **S. F. Radtke, C. J. Snyder and C. C. Childress**

Amer. Inst. Electrical Engineers Preprint, 1960, 18 pp.

All desirable lead alloys for cable sheathing can now be extruded as a result of modifications made to the Hanson-Robertson machine. This machine is already in commercial use.

CABLES

657 Lead and Lead Alloy Cable Sheathing Technical Bulletin No. 3, February, 1961 — **Lead Development Association**

Brochure, issued by the Lead Development Association, London.

Covers American research on continuous extrusion; research on feathering; an abstract of a German paper by A. Loeschmann on development of properties of lead alloys for cable sheathing; short circuit ratings for paper insulated, lead-sheathed cables up to 11 Kv.

CORROSION

658 The Corrosion Behaviour of Non-Ferrous Metals in Sea Water — **T. H. Rogers**

Trans. Inst. Marine Eng. (Canad. Div. Suppt.), Dec., 1960, No. 2, pp. 31–37.

Corrosion behaviour of lead, lead alloys, and other metals.

659 Conditions for the Cathodic Protection of Metals — **M. Pourbaix**

Corrosion Prevention & Control, Dec., 1960, 7(12), 43–48.

Diagrams of electrode potential/pH for 43 metals are given and critical electrode potentials of lead and several others in solutions of pHO, 7 and 14. Discussion of applicability of metals to cathodic production.

660 Corrosion Resistance of Lead(-Copper) — **R. E. Layman**

Met. Progress, Feb., 1961, 79(2), 118, 120.

Describes results of flash tests on lead containing 10–10,000 p.p.m. Cu and as a result of figures obtained, suggests uses of lead-copper alloys.

661 How to Choose Lead Linings for Process Vessels — **R. L. Ziegfeld**

Chem. Eng., Jan. 23, 1961, 68(2), 164, 166, 168–169.

Describes main types of lead linings for chemical vessels. Compares costs and permissible service conditions. Also covers resistance to corrosion and erosion and the use of Pb-Sb for valves, etc.

EQUIPMENT

662 Continuous Cast (Lead) Sheet — **Broken Hill Associated Smelters Ltd.**

Metal Bulletin, Feb. 3, 1961, p. 18.

Description of the machine built at the Melbourne Laboratories for continuously casting thin lead sheet or strip. The sheet is formed from the molten mass on the surface of a rotating water-cooled drum.

EXTRUSION

663 Temperature Changes Occurring During the Extrusion of Aluminium, Tin and Lead — **A. R. E. Singer and J. W. Coakham**

J. Inst. Metals, Feb., 1961, 89(6), 177–182.

Measurements of temperature of extrusions emerging from die for lead, aluminium and tin and ram speeds 1–30 inches per minute on 100-ton laboratory press. Temperature measured can be up to 200°C above billet temperature. Physical properties, extrusion ratio and speed of extrusion are factors controlling pattern of temperature rise.

GENERAL

664 Lead, Its Alloys and Compounds — **E. J. Mullarkey**

Ind. Eng. Chem., Jan., 1961, 53(1), 82–86.

Reviews developments in metallurgy of lead and in many of its uses. Subjects covered include sound attenuation, radiation shielding, bearings, leaded steels, etc.

MECHANICAL PROPERTIES

665 Effect of Air Pressure on the Fatigue of Lead and Aluminium — **K. U. Snowden**

Nature, Jan. 7, 1961, 189, 53–54.

Annealed strip of 99.99% lead fatigued in reverse plane bending at 500 cycles per month. Under high pressures life is constant. Under intermediate pressures life increases rapidly with decreasing pressure down to 0.005 mmHg. Under low pressures life is unaffected by further pressure reduction.

666 The Structure and Properties of Sand-Cast Gunmetals — **J. E. Stolarxzyk**

Brit. Foundryman, Dec., 1960, 53(12), 531–548.

A study of the effect on tensile, elevated diameter creep, porosity and pressure tightness of leaded and lead-free gunmetals, of composition and constitution. Suggestions for compositions to give optimum properties.

METALLURGY

667 Annealing Twins and Coincidence Site Boundaries in High-Purity Lead — **K. T. Aust and J. W. Rutter**

Trans. AIME Met. Soc., Dec., 1960, 218(6), 1023–1028.

668 Solidification of a Eutectic made from Zone-Refined Lead and Tin — **J. P. Chilton and W. C. Winegard**

J. Inst. Metals, Jan., 1961, 89(5), 162–164.

Zone-refined Pb and Sn were used in experiments to determine whether a eutectic made from pure materials solidifies with a cellular interface and to observe the structure as a function of the rate of solidification. It was found necessary that an impurity be present for cellular growth.

669 Diffusion of Gold in Lead Single Crystals — **A. Ascoli**

J. Inst. Metals, Feb., 1961, 89(6), 218–220.

Confirmation that no important grain boundary diffusion occurs, at least above 106°C.

REFINING

670 Debismuthising Lead by the Jollivet-Penarroya Process — **L. Jollivet**

Erzmetall, Dec., 1960, 13(12), 578–581.

(In German.) An elucidation of the earlier work of KROWL and of BETTERTON. Bi_2Mg_2Ca is shown to be the active agent in Betterton method. Using Mg and K, $Bi_7Mg_6Kg_1$ is formed and Bi content may be reduced to as low as 0.001%. Calculation of charges is described, with method of operation of a plant built by the Penarroya Company.

671 Investigation of the System Lead-Tin-Oxygen, with a Contribution on the Behaviour of Tin in the Dry Refining of Lead — **H. H. Hadamovsky**

Erzmetall, Dec., 1960, 13(12), 582–592.

(In German.) A re-examination of the quasi-binary section $PbO\text{-}SnO_2$ of the Pb-Sn-O system. Practical details of removal of Sn (during oxidative removal of Sn, As and Sb from Pb) are indicated.

SMELTING

672 Coke Combustion in the Lead Blast Furnace — **G. Waechter**

Erzmetall, Feb., 1961, 14(2), 53–63.

(In German.) Valuable heat is lost from the lead blast furnace by reaction of Co_2 and C giving endothermic formation of CO. It is shown that increase of CO_2 reduction is caused by all factors which intensify the combustion of coke: Reduced size of coke lumps, increased draught and increased O-content of the draught. Recommends simple practical measures.

673 Emission of Dust and Gases in the Non-Ferrous Smelting Industries — **G. Oswald**

Metal Bulletin, Feb. 24, 1961, pp. 14–15.

Reference to lead and zinc sulphide or roasting plants. Based on paper presented at Clean Air Conference of the Verein Deutscher Ingenieure at Wiesbaden, September 1960.

STATISTICS

674 Lead and Zinc in 1961 from the Italian Point of View — **G. Rolandi**

Metall, Jan., 1961, 15(1), 72–73.

(In German.) Covers production, consumption, prices and price fluctuations, and competition with synthetic materials.

675 Use of Non-Ferrous Metals in American Automobiles — **C. F. Root**

Metall, Feb., 1960, 15(2), 147–150.

(In German.) Gives quantities of lead and other metals used in various motor cars. Includes some very detailed tables.

676 Metal Statistics 1950–1959. 47th Annual Issue — **Metallgesellschaft A.G.**

Book, 1960, 254 pp., Metallgesellschaft A.G., Frankfurt-am-Main.

Annual statistical tables covering production and consumption by countries of lead and other metals. Detailed statistics for lead, including price records dating back to 1900.

PART 2 · PATENTS

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677 Deferred-Action Battery — **Electric Storage Battery Co.**

British Patent 861,806

The electrolyte is contained in a reservoir separated from the battery by a rupturable diaphragm. The unit is fitted with a knife for piercing the diaphragm and a means for forcing the electrolyte into the battery casing. The motive power is a gas-generating squib which will operate the knife and contract the reservoir, which is preferably in the form of a bellow.

678 Deferred-Action Battery — **Compagnie Industrielle des Piles Electriques**

British Patent 861,874

This patent describes an acid-free battery mounted beneath a hood. At the upper end of the hood there is a diaphragm which can expand sufficiently to allow liquid in the bottom of the hood to rise to the top surface of the battery. When the battery operates, the gas generated displaces the liquid down and out of the hood.

679 Porous Lead Electrodes — **W. Heberer**

German Patent 1,100,738

To the positive lead paste there is added a small proportion (i.e. 30th–100th) of amorphous carbon in which are embedded finely dividing binding substances comprising granular mixtures of silica, alumina, magnesium oxide, titanium oxide, beryllium oxide and iron oxide.

680 Grid Alloy — **Imperial Chemical Industries Ltd.**

British Patent 869,618

Grids for battery plates can be made of titanium or zirconium or alloys based on these metals. The positive grids are then coated electrolytically, or otherwise, with a noble metal such as platinum.

681 Connectors — **Chloride Batteries Ltd.**

British Patent 869,763

The inter-cell connector, or battery terminal connector, may be made from a lead or lead alloy rod shaped to be an approximate fit in the hole in the partition or end wall. After it has been placed in position it is squeezed from both ends so that it swells in the middle, thus forming a tight joint between itself and the walls of the hole.

682 Filling Device **Chloride Batteries Ltd.**

British Patent 869,768

This patent describes a filling system which ensures that the electrolyte is adjusted to the proper height on topping up. It consists of a filling tube extending down to the highest level of the electrolyte, vented orifice coming from this tube, and ball valve in the throat of the orifice. During normal filling, the ball valve prevents the escape of air through the orifice so that when the lower end of the tube is covered by the rising liquid, the electrolyte builds up inside the tube. When the battery is put to use, a cap is placed on the top of the filling tube, displacing the ball from its seat so that the cell may be vented normally.

683 Restricting Oxidation of Negative Electrodes **Accumulatoren-Fabrik, A.G.**

German Patent 864,592

The electrode is impregnated with a 2–5% solution of boric acid by spraying or immersion. This solution may with advantage contain a small amount of phenol or cresol. The plates are then dried in the ordinary way.

CASTING

684 Production of Ingots and Castings **Foundry Services International Ltd.**

British Patent 867,685

The hot-top of the casting is contained in a heat-resisting material, embedded in the face of which is a layer of ingredients which react exothermically when ignited. These are not distributed at random throughout the lining but are in the form of a layer next to the metal surface. The layer does not extend completely to the top and bottom of the hot-top, but stops a little short in both directions, and its thickest section is above the mid-point of the height.

CATALYSIS

685 Oxidisation Catalysis **Behncke H., Essig R., Kaiser A.**

German Patent 1,105,853

The supporting carriers are impregnated with the usual metal solutions and then with lead compounds such as lead salts. After calcination, these units are suitable for purifying lead-laden waste gases.

ELECTROLYSIS

686 Lead Dioxide Electrode — **Pennsalt Chemical Corporation**

German Patent 1,105,854

This is similar to British Patent 850,379 in which it is mentioned that lead dioxide deposited on rigid metallic structures to form anodes is liable to crack and allow the corrosive electrolyte to attack the underlying metal. The patent specifies flexible metallic support for the lead dioxide in the form of wire mesh or punched sheet.

ELECTRONICS

687 Thermoelements — **Research Institute of Urban and Rural Telephone Communication**

Indian Patent 69204

2–3% of lead is added to a zinc antimony alloy during the hot pressing process.

688 Ferromagnetic Material — **Philips Elec. Ind. Ltd.**

British Patent 862,821

This ferromagnetic oxide material contains 8–21 mol.% of barium, strontium, calcium or lead, monoxide.

689 Semi-Conductors — **Compagnie Generale de Telegraphie Sans Fils**

German Patent 1,106,576

Lead or a lead-germanium alloy is used in conjunction with a pure germanium base to produce either i-n or i-p transistors.

ENAMELS

690 Lead Bearing Enamel — **Consolidated Electrodynamics Corporation**

An enamel, having as the major constituent of the flux a mixture of lead borate and lead borosilicate, is suitable for use on metals, glasses and refractories.

EXPLOSIVES

691 Lead Styphnate — **du Pont**

British Patent 862,704

A blasting cap, having lead styphnate as the ignition composition, may be made less sensitive to initiation by electrostaic discharge by placing a thin layer of powder between the lead styphnate layer and the plug holding the electrical connections. The layer is relatively thin and the size of the particles is less than 60 microns: an explosive powder such as lead nitrate-bis-basic lead-4, 6-dinitro-o-cresylate is suitable.

692 **Lead Lining to Container** — **Rikkihappo-ja-superfosfattite-htaat Oy**

German Patent 1,101,250

Delay-action compositions for fuses are contained in a vessel, the inner surface of which is made of lead or other soft material, or treated in a suitable manner, in order to prevent the composition moving about during the combustion period.

EXTRACTION

693 **Lead Production** — **Sherritt Gordon Mines Ltd.**

Indian Patent 69828

The lead compound in the ore is first converted to one which is soluble in an alkylene or alkanol amine (or a salt or derivative) and the mass is then leached with that solution at a temperature below 100°C.

GLASS

694 **Glass Having Low Temperature Coefficient of Dielectric Constant** — **Philips' N.V.**

Australian Patent 61,862,60

Glass of the above characteristics may contain 4–7 mol.% lead oxide.

LEAD TETRAETHYL

695 **Antiknock Agent** — **Ethyl Corporation**

British Patent 865,343

A petroleum spirit containing lead tetraethyl can be improved if manganese is added in the form of cyclopentadienyl manganese tricarbonyl. The ratio of manganese to lead may vary between the limits of 0.0011 to 500, and as well as raising the octane number, it is claimed that the addition will have a beneficial effect on problems of surface ignition, octane requirement and plug fouling. In order that the exhaust valve life should not be adversely affected, spirit soluble organic derivatives of metals from groups I or II should be added.

METALLURGY

696 **Coating Surfaces** — **General Electric Co. Ltd.**

British Patent 863,087

Soft metals, e.g. aluminium, copper, tin, zinc or lead, may be deposited on a harder material by loading the former on to a rotating wire brush and bringing this into contact with the harder surface.

MISCELLANEOUS

697 Improved Anode — **Metal and Pipeline Endurance Ltd.**

British Patent 870,277

To a lead or a lead alloy anode there is attached either a platinum group metal or graphite, which is exposed to the electrolyte. For preference, the lead alloy should contain up to 10% silver and/or 16% antimony.

NUCLEAR SHIELDING

698 Casting Procedure — **Knapp Mills Inc.**

British Patent 862,571

This patent describes the well-known "puddling technique" used in the casting of large lead components to ensure freedom from shrinkage cavities. Molten lead is poured into the casting mould, which is cooled from below. As the lower layers solidify, more molten lead is added so that as the casting progressively freezes from below, a constant head of liquid metal is maintained on the top. Means are provided for applying cooling at the base, and directing that cooling. Similarly, a heating medium may be applied to the molten surface if necessary. A probe is used to determine the depth of the molten layer.

699 Lead/Plastic for Shielding — **Associated Lead Manufacturers**

British Patent 868,524

Lead powder may be dispersed in unplasticised polyethylene or polypropylene to form a rigid material, and the latter shaped into a slab or any other thick component.

PIGMENTS

700 Lead Phosphate and Lead Silicate — **National Lead Co.**

German Patent 1,099,672

The composition ranges of the ingredients of this pigment are given, together with a method of manufacture, in which silica and litharge are mixed and then a phosphoric acid or a phosphate solution is added with stirring. The paste is dried and calcined at 500–850°C.

REFINING

701 Lead Refining — **National Cylinder Gas Co.**

British Patent 865,212

Tin and zinc are completely oxidised from molten lead and antimony reduced to 0.03% by heating the metal to at least 1000°F, preferably 1000°–1400°F, and lancing with an air/oxygen mixture containing at least 40% of oxygen by volume. The composition of the alloy is given from which the lances are made.

702 Separation of Lead and Zinc — **Metallurgical Processes Ltd. & National Smelting Co. Ltd.**

German Patent 1,104,191

Zinc containing a small amount of lead may be purified by vacuum distilling at 450–500°C, the vapour being virtually free from lead. In another process the material can be distilled in vacuo to produce zinc vapour, containing only a little lead, which is condensed in a stream of molten zinc at a lower temperature. This is transferred to a lower temperature zone where the zinc is evaporated and condensed in a pure state.

703 Molten Metal Cathodes — **U.S. Atomic Energy Commission**

Uranium or thorium may be electrolysed from their fused salts, using a variety of metals, one of which may be lead, to form the molten cathode.

SMELTING

704 Extraction of Lead — **Sherritt Gordon Mines Ltd.**

British Patent 867,819

Lead sulphate, chloride, acetate, nitrate or monoxide is leached with an aqueous solution of alkylene or alkanol amine (or water-soluble derivatives thereof) at a temperature preferably below 100°C. The lead compounds dissolve, and the metal is then precipitated in the form of a carbonate by reaction with carbon dioxide, after which it is reduced under suitable conditions to produce comparatively pure metallic lead.

705 Determination of the height of the charge in a shaft furnace — **Ges. für Hüttenwerksanlagen**

German Patent 1,107,261

The height is ascertained by measuring the pressure difference, at two different heights in the furnace shaft, of a gas, preferably air, which is introduced for this purpose.